Scaling in the Community Structure of Networks

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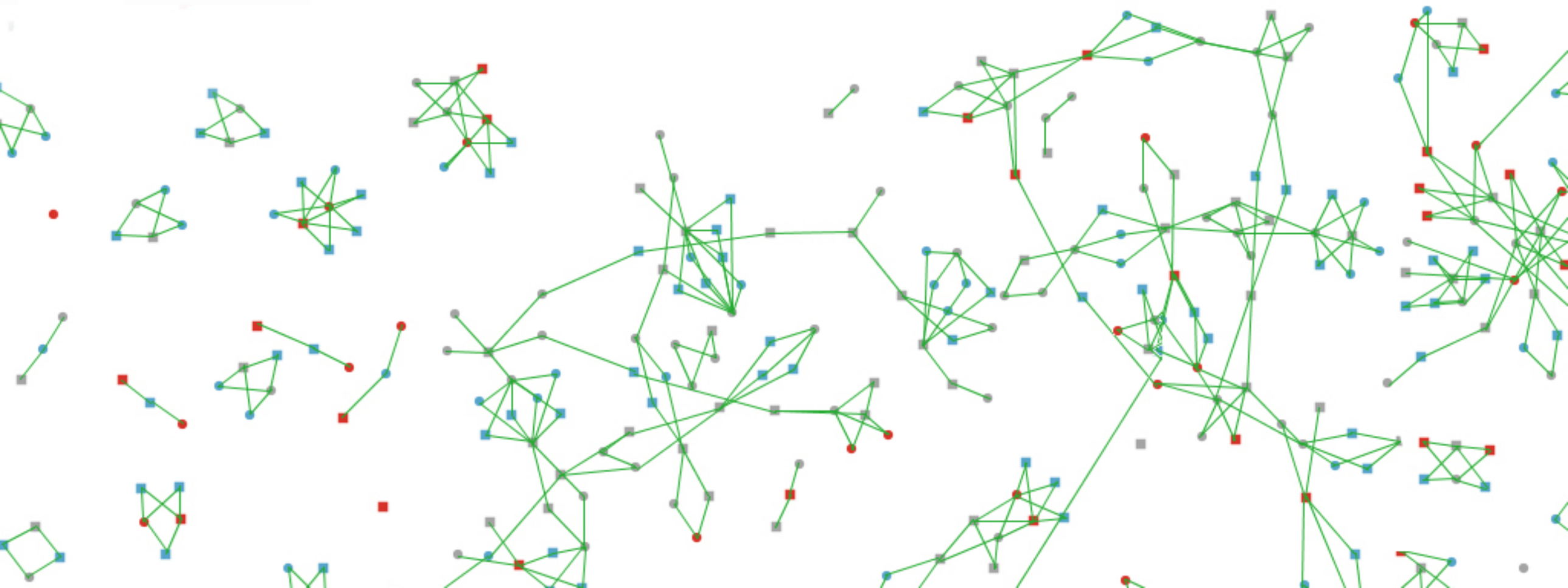
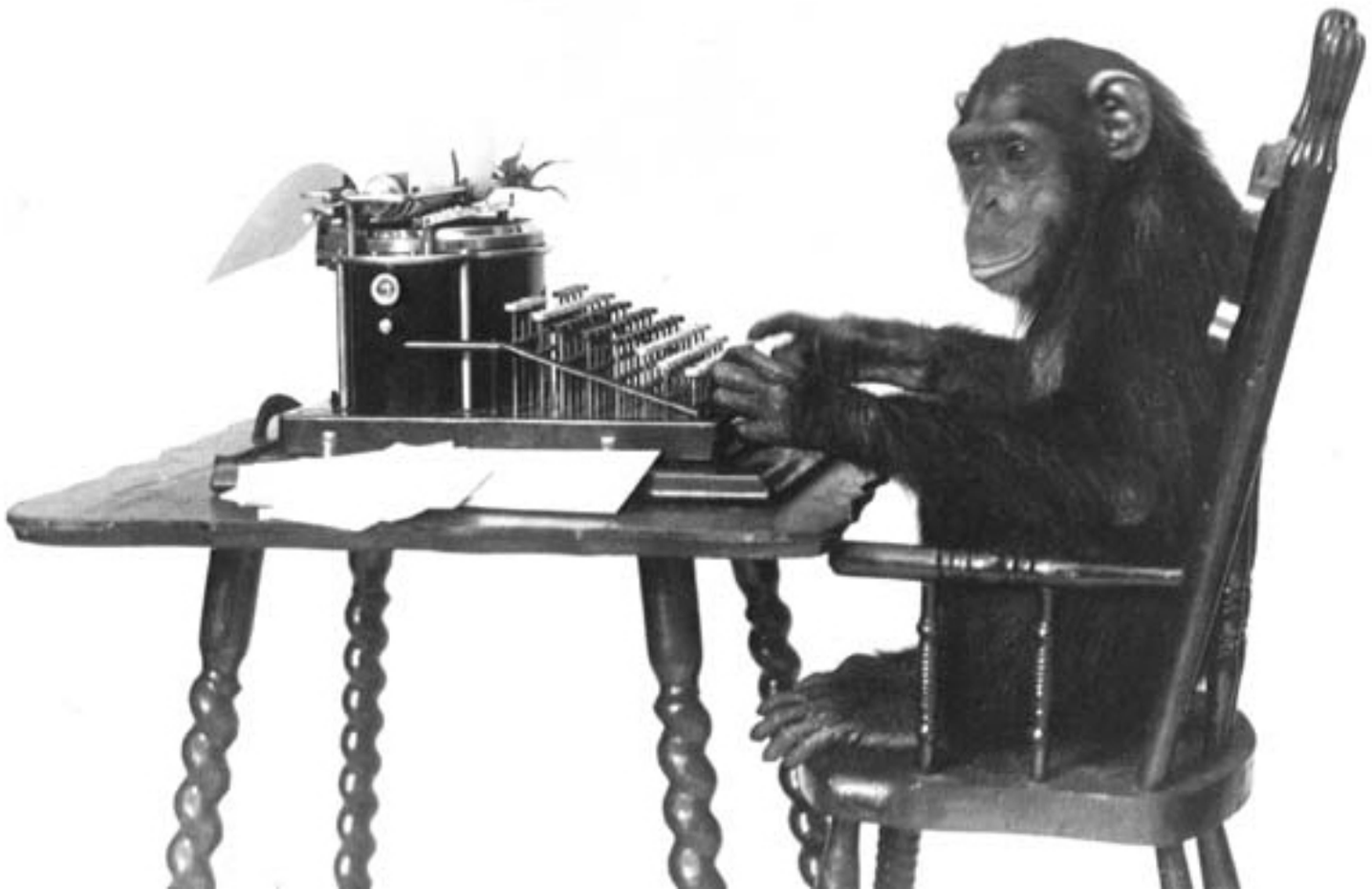


A NetLogo Computer Model to Test Genetic Distance as a Sufficiency Conditions for Reproducing the Same Statistical Properties as Actual Data from Hunter-Gatherer Societies Regarding the Power Law Distribution of the Scaling Factor of Group Sizes



The Problem:

- Non-Spatial Model
- Genetic Distance is 1D parameter
- Need to Measure Community Structure

The Solution:

Build a Network Model!

- Edges (and their weights) can be ANYTHING!
- Maps 1D parameters in n-Dimensional space
- Several off-the-shelf measures available
- Networks are sexy, fun, and fashionable

Model Description

1. Initial population is 50:50 Male:Female; Ages uniform 0 to age-at-first-birth; No genetic relations

2. When females come of age the hunt for an of-age single male whose genetic relation is no greater than the amount specified

3. If such a male is available, then they marry and have a defined probability of having a baby (50:50 Male:Female)

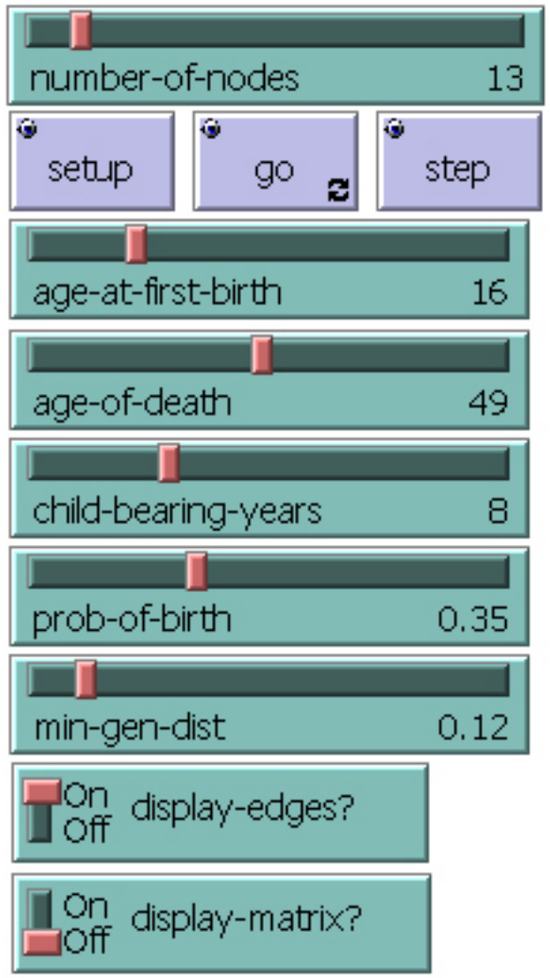
4. This continues throughout the females' child-bearing years

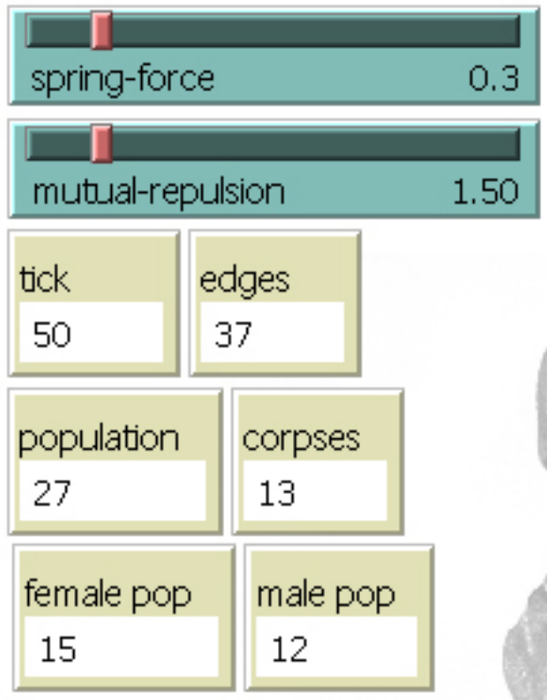
5. Agents die when they are told (same for everybody)

Choose a platform

- Repast
- Mathematica
- Matlab
- NetLogo

Choose the Parameters





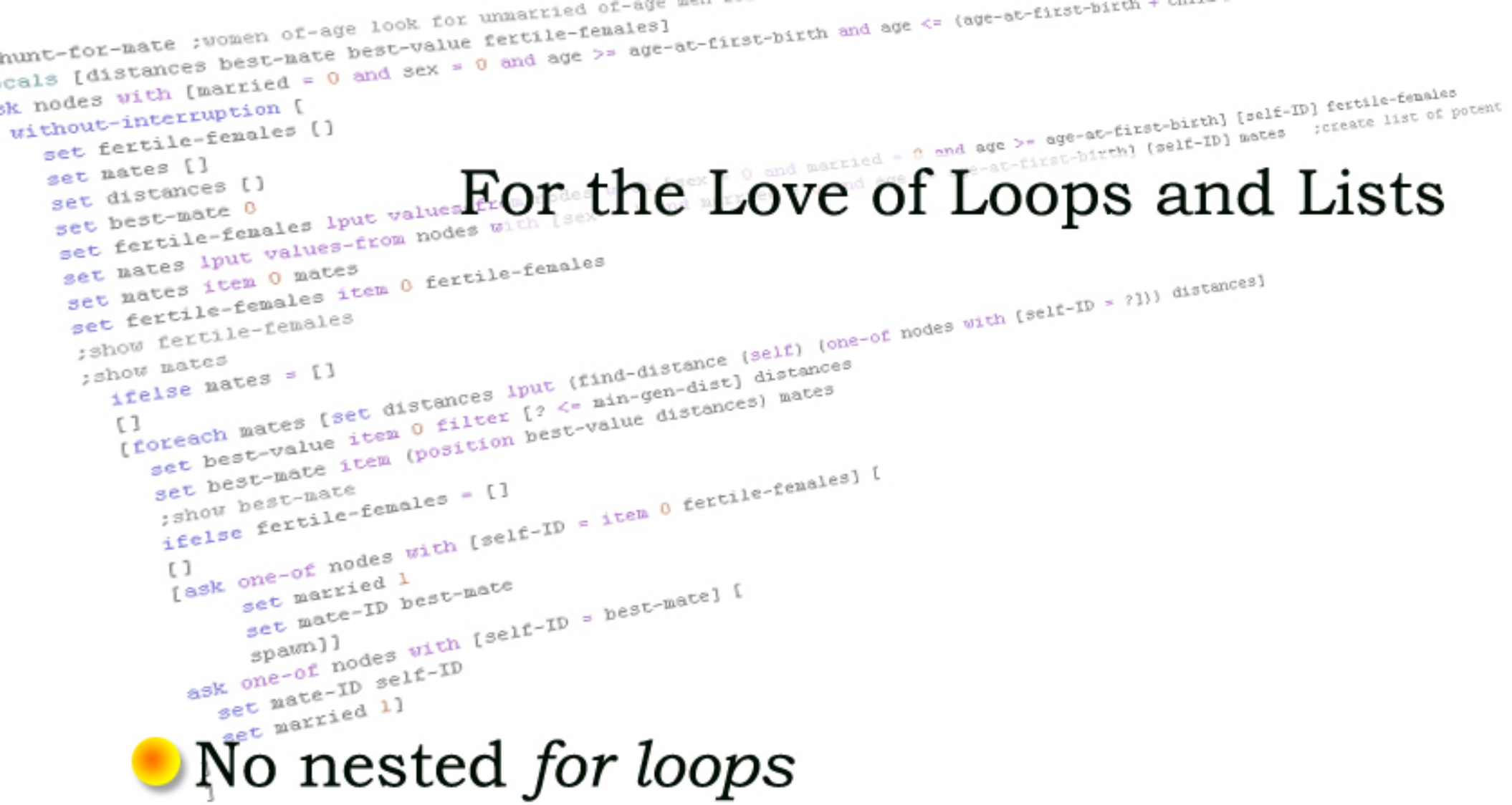
No Hidden Parameters

Implementation in NetLogo

Building the Adjacency Matrix

- NetLogo does not have 2D arrays
- Closest thing is lists of lists
- Only a psychotic moron with masochistic tendencies and hours and hours to waste would even try to use NetLogo to implement an adjacency matrix.

For the Love of Loops and Lists



- No nested *for loops*
- Synchronous, not serial, activation of “turtles”
- My favorite part of building this model was when both men and women were all marrying the same man (who was married to himself) and everybody was giving birth to pregnant babies

Deep Thoughts

by Jack Handey

I believe in making the world safe for our children,
but not our children's children,
because I don't think children should be having sex.

The Legend of Hunter-Gatherer Societies

Male

Females

Under age-at-first-birth

Fertile Years

Over the Hill

Genetic Relation

.50 .40 .30 .20 .10

Made it to Third Base

- Became intimately familiar with NetLogo
- Unfortunately, I did not make it “all the way”
- No reason to continue developing the model
- Donate code to the modelling community